Texas Highways

October, 1958 35c

Picnic scraps — not bodies — are attracting these vultures to the Chisos Mountains Basin of Big Bend National Park.

Texas Highways

Volume 5 • Number 10

October, 1958

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To Improve and Strengthen Subgrade and Flexible Materials

HYDRATED LIME

J. F. Snyder, District Engineer
District 21

Foreword

Lime as an additive for stabilization of active clay soils for subgrade use and for treatment of base materials to reduce plasticity and increase triaxial strength is gaining recognition as one of the highway engineer's most important tools. Results and experience from continued and extensive use of lime in this district have been both enlightening and astonishing.

The first successful use and experience with lime in this district was in stabilizing subgrade at and around leaky irrigation siphons at highway crossings. When lengthening, adjusting, and rearranging these irrigation siphons, a great deal of water is often lost or has already been lost because of leaks and seeps, and this causes a waterlogged subgrade. Repairing and correcting these subgrade conditions often results in the conditions getting worse the longer they are worked with; and, in spite of the contractor's efforts in removing the bad or waterlogged material and replacing it with stable material, the same condition or "quick condition" often recurs before the subgrade can be prepared and base material set up. The use of lime in such areas usually cures the condition at once, and subgrade can be shaped without difficulty. Base work can then follow immediately. Once the value and results of lime additive have been demonstrated to a contractor, he becomes a willing user.

Subgrade material which had been treated by maintenance forces had to be broken up by a scarifier before removal by the contractor.

For the past several years, it has been common practice in District 21 to strengthen soft spots in subgrades during construction by admixing hydrated lime with the unstable subgrade material. The district maintenance forces have used lime rather extensively, also, in repairing failures in both flexible bases and in subgrades.

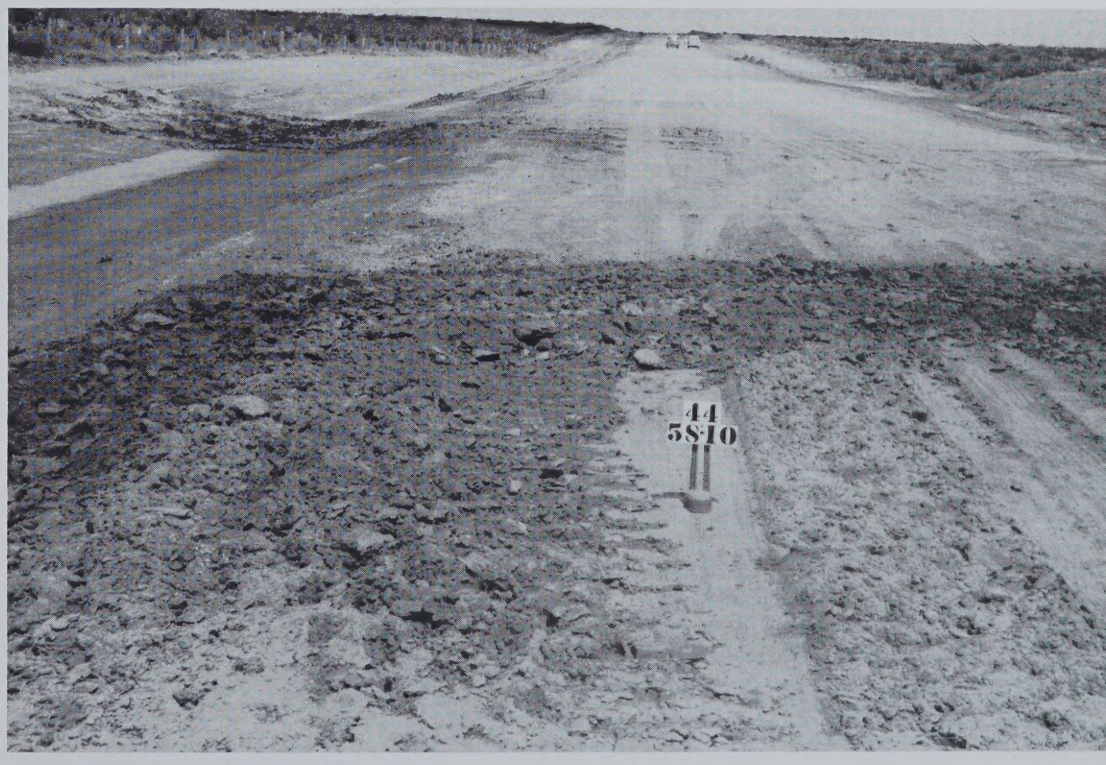
In 1956, a section of U. S. 83 in Zapata County just north of the town of San Ignacio failed due to seepage of irrigation water from adjoining fields. A special maintenance project was set up for the repair of 3,000 feet of the highway.

Maintenance forces removed and stockpiled the pavement and flexible base, spread 98 sacks of lime per station over the subgrade, mixed to an approximate depth of twelve inches with a disc and blade, then compacted with sheepsfoot rollers. The salvaged base was relaid using twenty sacks per station of lime admixture. This section was paved with a two-course surface treatment and opened to traffic.

In 1957, a contract was let for the reconstruction of U. S. 83 from a point just south of San Ignacio north to the Webb County Line. This contract called for admixing 4 per cent lime with the subgrade material. In reworking the section treated by the maintenance forces, the Contractor found it necessary to use a tractor-drawn scarifier to break up the subgrade. We believe that this is a fairly good example of the lasting qualities of lime, since only a small quantity (approximately 1 per cent by weight) of lime was used and stood up well under traffic for more than a year.

At present, there are several projects in this district in various stages of construction that require the admixing of lime with both the subgrade and flexible-base materials. In some sections, good flexible-base material is extremely hard to find; and, in these areas, the reconstruction projects call for strengthening the subgrade by admixing lime and relaying the salvaged flexible base with lime without adding any new base

Untreated subgrade, after rain, looks bad. Treated subgrade, in the background, which has been partially compacted, is in better condition.



The partially compacted treated subgrade withstood the rain well. Completed subgrade in background is unharmed.

A close-up of the completed subgrade—after a 2.7-inch rain—shows its condition.

This subgrade has been treated with 4 per cent lime and partially compacted. Salvage base material can be seen stockpiled at right.

material.

One such project, a ten-mile section of F. M. 863 in Duval County, between Encinal and Freer, is approximately 50 per cent complete and is a good example of the effectiveness of the lime-treated subgrade. The grading and drainage structures were completed in May, 1954. Eight inches, compacted thickness, of flexible base and a two-course surface treatment were completed in October, 1954, and stood up very well under traffic until the early spring of 1958. During an exceptionally wet season the subgrade failed so badly that it was decided to rebuild this section of highway.

The contract for this reconstruction provided for salvaging and stockpiling the flexible base, preparing subgrade for the full crown width, admixing 4 per cent dry lime to the subgrade, relaying the salvaged base, and placing a two-course surface treatment.

The subgrade material was found to have a Triaxial Classification of 6.0 with a P. I. ranging from 35 to 44. Laboratory tests indicated that this material could be brought up to a Class 1 material by adding 4 per cent hydrated lime. The dry lime was spread across the subgrade and mixed with a heavy-duty disc and blade, compacted with sheepsfoot and heavy pneumatic rollers, and opened to traffic.

The operation of treating the subgrade is practically complete on this ten miles, and no failures have developed in spite of the fact that the subgrade has been open to traffic and has had one two-inch rain plus several heavy showers during this time.

Barricade with a special sign bolted in place.

Changeable Barricade Signs

Earl F. Wyatt, District Maintenance Engineer
District 13

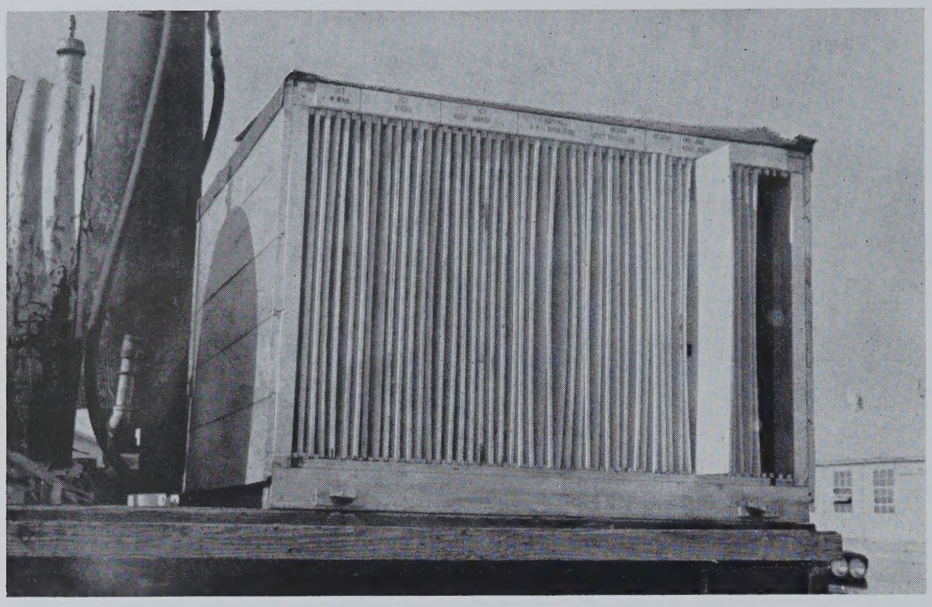
In spite of our excellent standard maintenance barricades, we have at times wished for special signs for unusual situations. To solve this problem, we have worked up in this district a series of changeable signs which are bolted on the face of a standard Maintenance Barricade "H" with wing nuts.

When not in use, the signs are stored in a weatherproof indexed box which is slotted to keep the three-eighths-inch plywood signs from rubbing against each other. The box is divided into sections and marked with sign legends to enable quick selection. We have drilled four three-eighths-inch holes in each of our standard barricades so that any one can be used with a special sign.

The plywood panels have a sign painted on each side to have a larger selection of signs on a minimum number of panels. For each of our maintenance sections, we have had the following signs made.

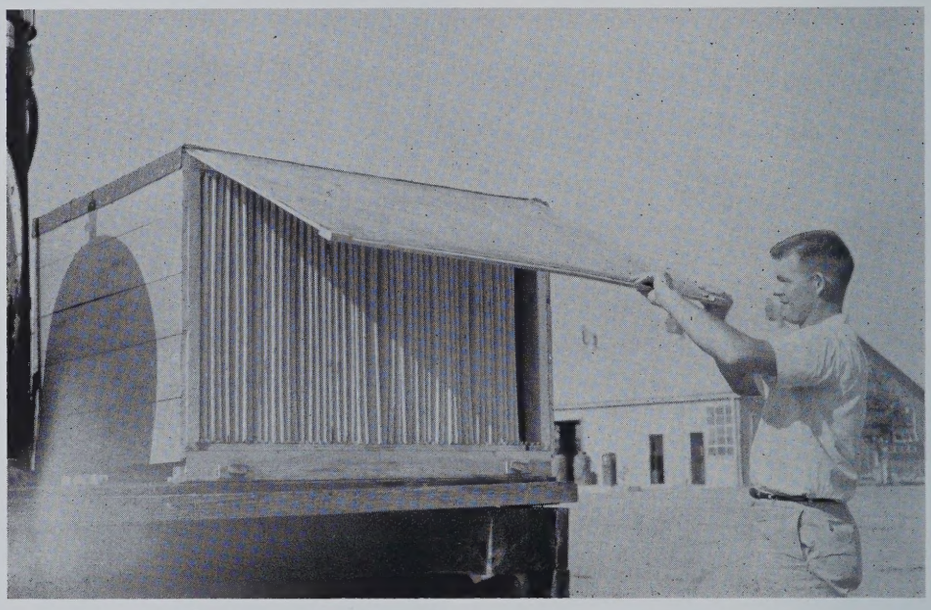
In view of the response to these signs in this District, we feel that this idea may be of value to others.

Sign-storage box with several signs displayed.



Sign-storage box showing the index of different signs.

Bruce Card, Junior Engineering Assistant, demonstrates the hinged weatherproof front of the sign box.

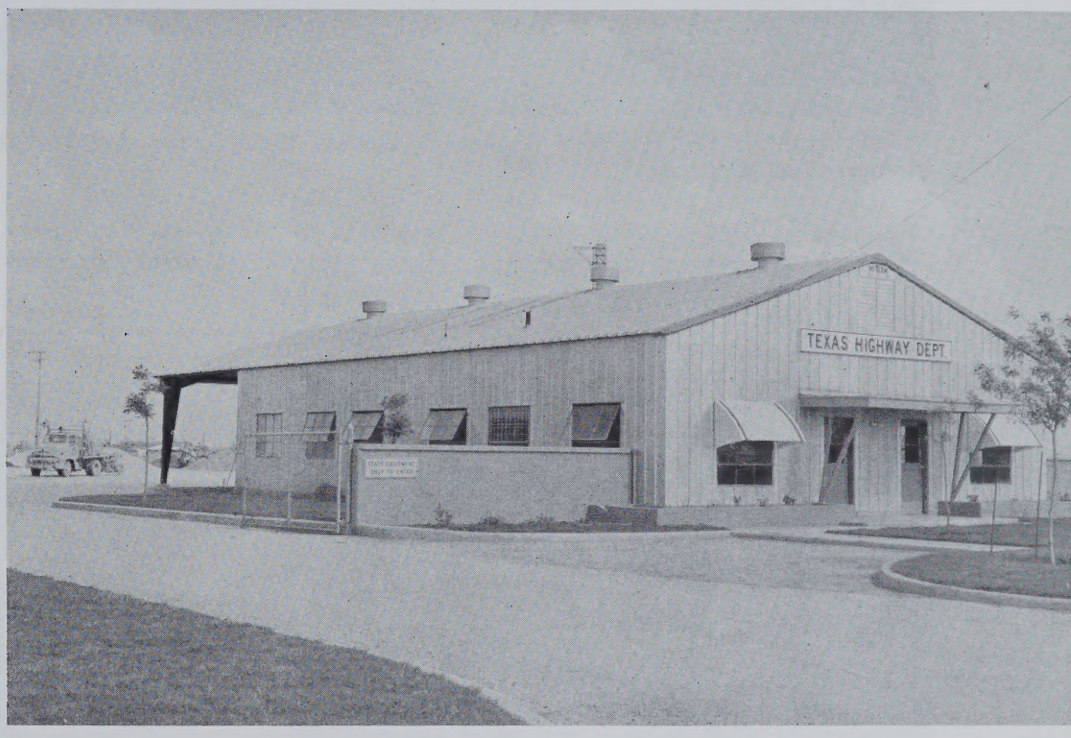


Number	Front Face	Reverse Face
8	Road Closed High Water	Watch for Ice on Bridge
8	Watch for Flying Rock	Watch for Ice on Bridge
6	Road Closed—Bridge Out	Soft Shoulders Keep Off
8	Fresh Asphalt—Keep Off	Please Do Not Drive on Shoulder
4	Temporary Detour ←	Temporary Detour →
4	One-Lane Traffic Road Repair	Keep Right
3	STOP Ask Watchman for Road Information	Watch for High Water
4	STOP Ask Watchman for Road Information	Watch for Ice on Bridge
3	Watch for High Water	Soft Shoulder—Keep Off

Resident Engineer's Office

R. N. Jennings
District Maintenance Engineer
District 7

Resident Engineer's Office.



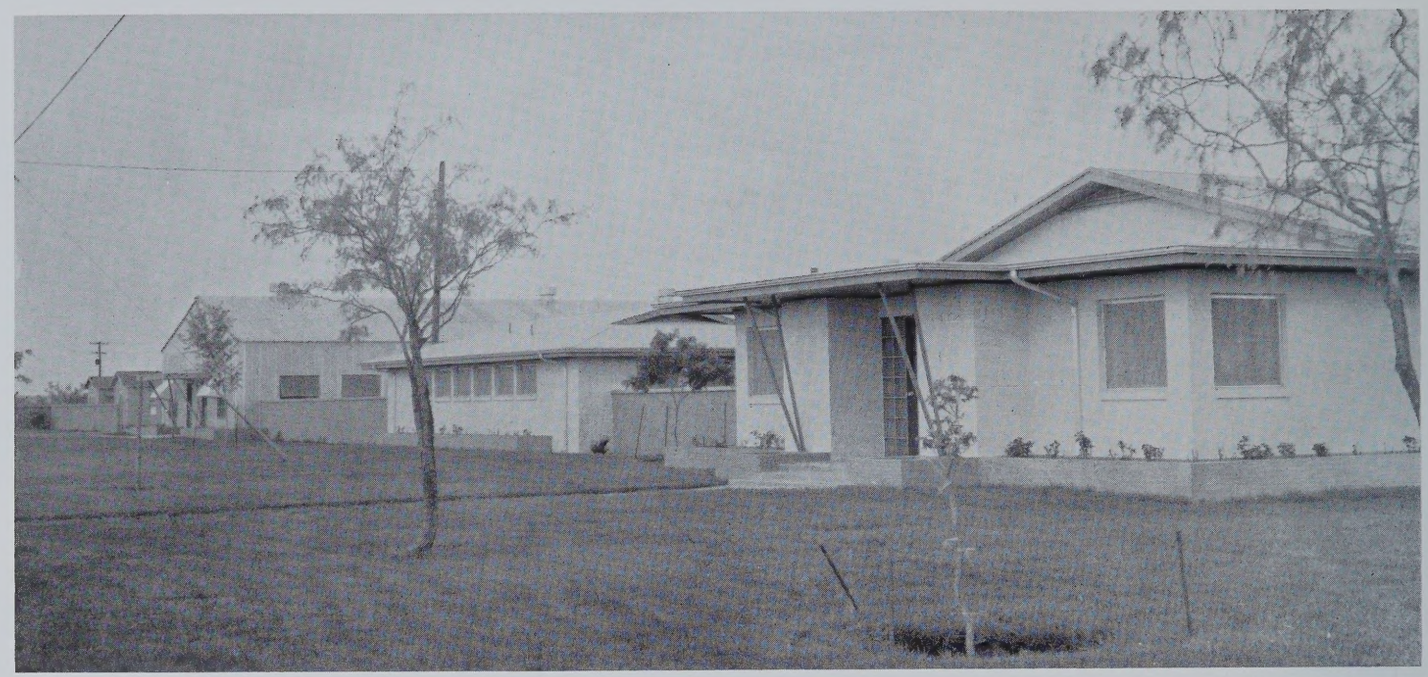
Maintenance Warehouse.

A new installation has recently been completed for a Resident Engineer and Maintenance Foreman at San Angelo which, we feel, combines sightly appearance with efficient arrangement.

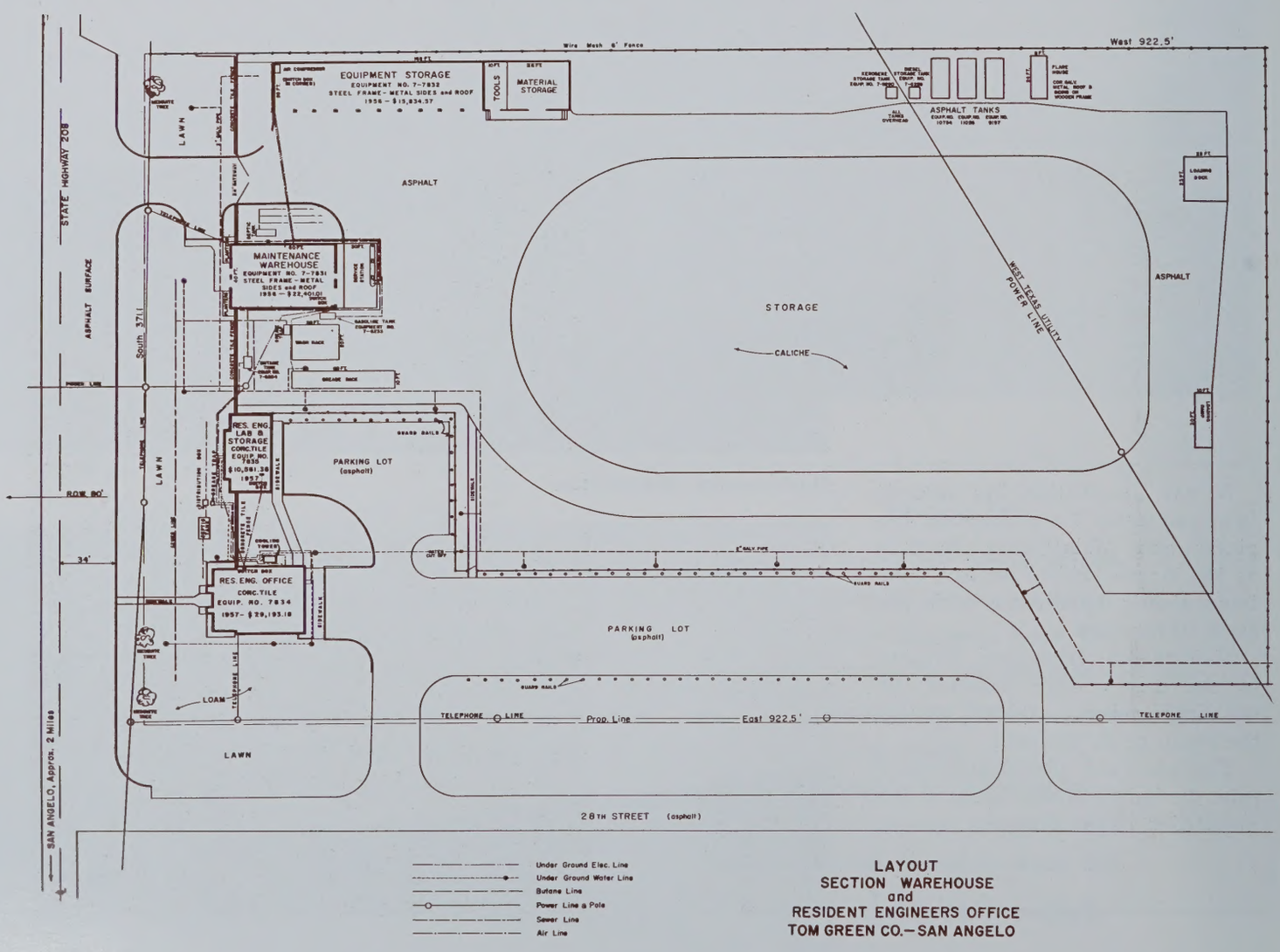
Maintenance Operations Division of the Austin office designed the buildings and assisted in planning the layout of the grounds.

The plat and photographs illustrate the buildings and layout of the installation in San Angelo.

Equipment Storage.



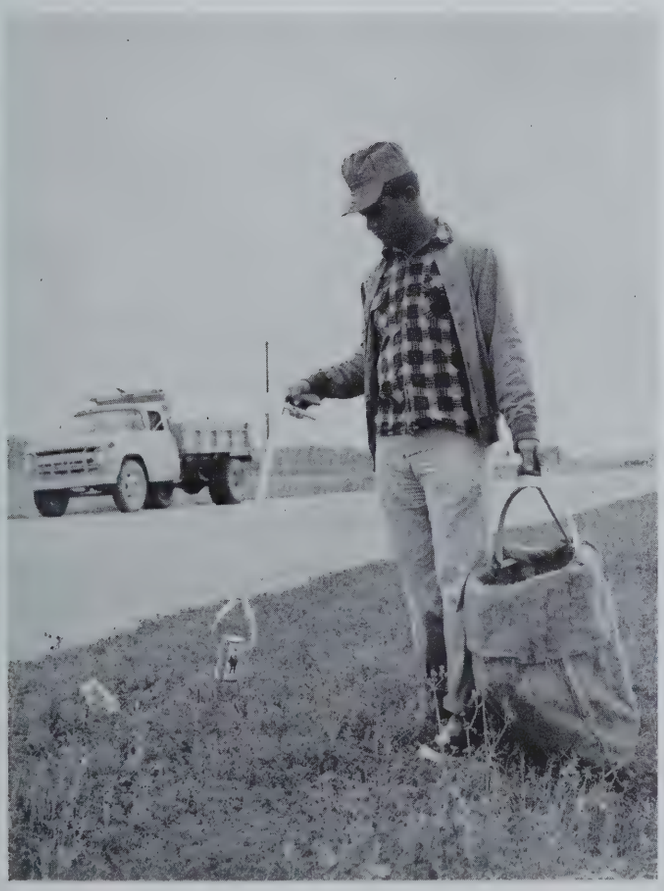
On the right is the Resident Engineer's Office. Next is the Resident Engineer Laboratory, followed by the Maintenance Warehouse.



LAYOUT
SECTION WAREHOUSE
and
RESIDENT ENGINEERS OFFICE
TOM GREEN CO.—SAN ANGELO

What Will They Think of Next!

There's no wasted motion in the operation of this gadget, demonstrated here by Sidney Howard of the Alvin Section of District 12. A pick-up device that saves on the back muscles would certainly indicate that we take care of our employees—but in this instance the device also saves time and money for the Department.



United Community Campaigns Months

State Highway Engineer D. C. Greer, center, chairman of the Public Employees Division of the United Fund, looks on as Governor Price Daniel affixes his signature to the document proclaiming the months of September, October, and November as UNITED COMMUNITY CAMPAIGNS months. On the left is David B. Irons, Insurance Commissioner, and chairman of the State Employees, United Fund Drive. Standing to the right is Maurice Acers, member of the Texas Employment Commission, serving as General Campaign Chairman of the United Fund for Austin and Travis County.

Official Memorandum

By

PRICE DANIEL
Governor of Texas

AUSTIN, TEXAS

GREETINGS:

The United Community Campaigns, frequently called United Fund or Community Chest drives, deserve the support of everyone.

Many worthy activities benefit from this unified approach, and the contributor has the added satisfaction of knowing that whatever he or she gives will be used for the greatest possible good.

These co-ordinated efforts to raise operating funds for local and national health, welfare, and character-building agencies make fund-raising more efficient and equitable.

THEREFORE, I, as Governor of Texas, do hereby designate the months of September, October and November, 1958, as

UNITED COMMUNITY CAMPAIGNS MONTHS

in Texas, and urge all of the people of our State to participate generously in the campaigns which are carried on in their local communities.

In official recognition whereof, I hereby affix my signature this 19th day of August, 1958.

Price Daniel
Governor of Texas

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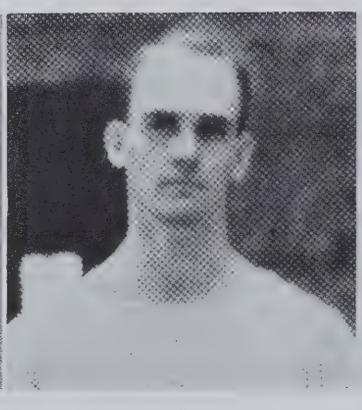

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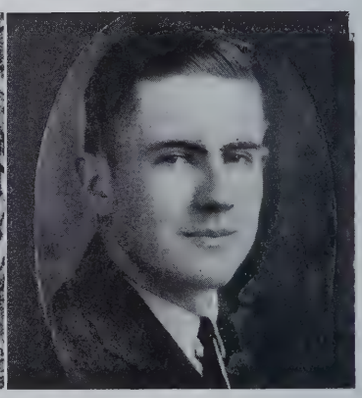

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TIME DOES FLY!

Some 25 or more years ago, The University of Texas really did contain its famed forty acres.

"The Fountain" had just come into existence, and the Main Building Tower—although dreamed of—was not yet off the drawing boards. Guadalupe bordered the campus on one side, as did San Jacinto on the other. But the activities between the two boulevards were on a somewhat smaller scale than today. There was not the least bit of concern over satellites, missiles, or who puts the first hotel on the moon.

Many changes have taken place. Students have come and gone. It's a lot of fun to look back on those times and compare them with things as they are today. Scattered among the divisions and districts of the Texas Highway Department are men who attended The University of Texas during those earlier days. That was a time when you actually *could* make it from one side of the campus to the other in the ten-minute break between classes.

A few months back, we ran pictures of employees who had attended Texas A&M. We heard many a chuckle from former "fish." This month we are doing the same with some Texas Exes. And did you ever see a bunch of Longhorns standing around that some Aggie didn't try to bust into? You'll find it here. He may be outnumbered twelve to one, but we bet he can hold his own, anyway.

Just to give you a hint on who they might be, you will find a few clues regarding each man's college-day activities. But if a receding hairline or some other change in appearance completely baffles you, turn to page 17 for a complete identification.

A. W. Eatman
Smiley, Texas
Club Handball Doubles Champion
Civil Engineering

John L. Green Hallettsville, Texas Chi Phi Law	A. C. Gentry Tyler, Texas Theta Xi Architectural Society Architectural Engineering	A. C. Kyser Rhoane, Texas Tau Beta Pi Civil Engineering	Fred T. Bennett Mexia, Texas Civil Engineering Texas A&M
George Pendergrass Dardanelle, Arkansas Delta Tau Delta Basketball Center BBA	Harvey Deen Theta Xi Engineering	Tom Collier Troup, Texas Civil Engineering Mechanical Engineering	Ed Bluestein Lake Charles, Louisiana Phi Sigma Delta Tackle Civil Engineering
Palmer Massey Madisonville, Texas President, Junior Engineering Class Civil Engineering	C. B. Thames Gonzales, Texas President, Senior Class '22 Cowboys Theta Xi Track Civil Engineering	J. A. Snell Coopertown, Oklahoma ASCE Civil Engineering	John Nations Austin, Texas BBA

District Engineers' Meeting

District Engineers and Division Heads met in Austin August 12 through August 14. Subjects discussed at the meeting included the 1959 and 1960 Federal Aid Secondary Highway Program; highway and bridge design; right of way and the 50-50 reimbursement; maintenance and interstate signing and marking, and miscellaneous selected topics.

State Highway Engineer D. C. Greer discusses a right of way problem. At right is Harvey Deen, Engineer of Aid Projects, and to the left is Ben Averyt, Right of Way Administrative Engineer.

Over a cup of coffee, District Engineer C. N. Parsons of Del Rio talks with Herbert Beadle of the Bridge Division.

W. E. Carmichael, District Engineer at Houston, listens with W. E. Simmons, District Engineer at Beaumont, as J. F. Snyder, District Engineer at Pharr, tells how he solved a problem.

Visiting between sessions are E. D. Parmer, District Administrative Engineer at Beaumont, and Harry Johnson of Accounting Division, Austin.

The "Urban Highway Practices" booklet comes in for discussion by District Engineers J. A. Snell, L. D. Cabaniss, and G. A. Youngs—of the San Angelo, Paris, and Atlanta Districts.

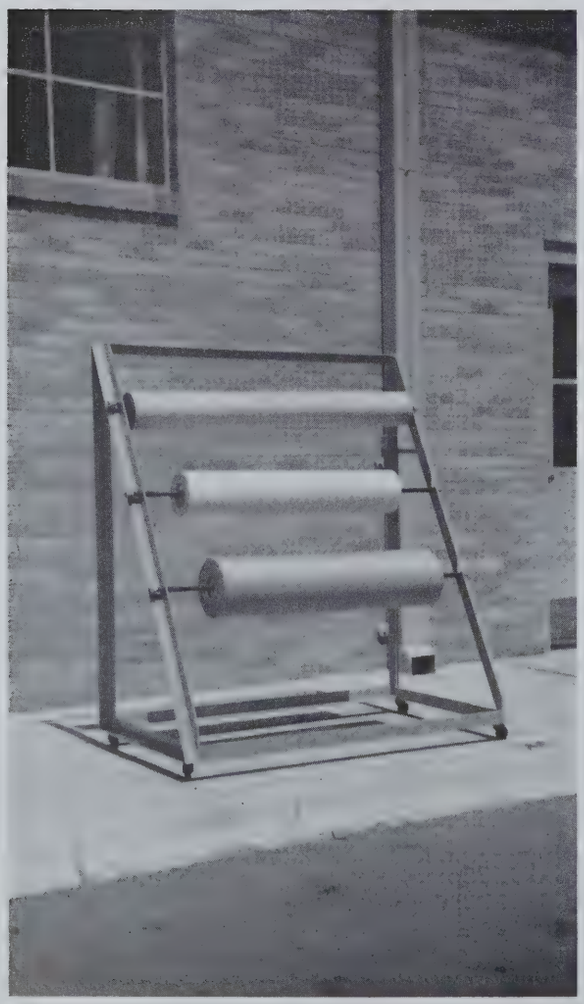
There might be more than highway business involved in this conversation between District Engineers Frank Cawthon of Dallas and E. W. Mars of El Paso.

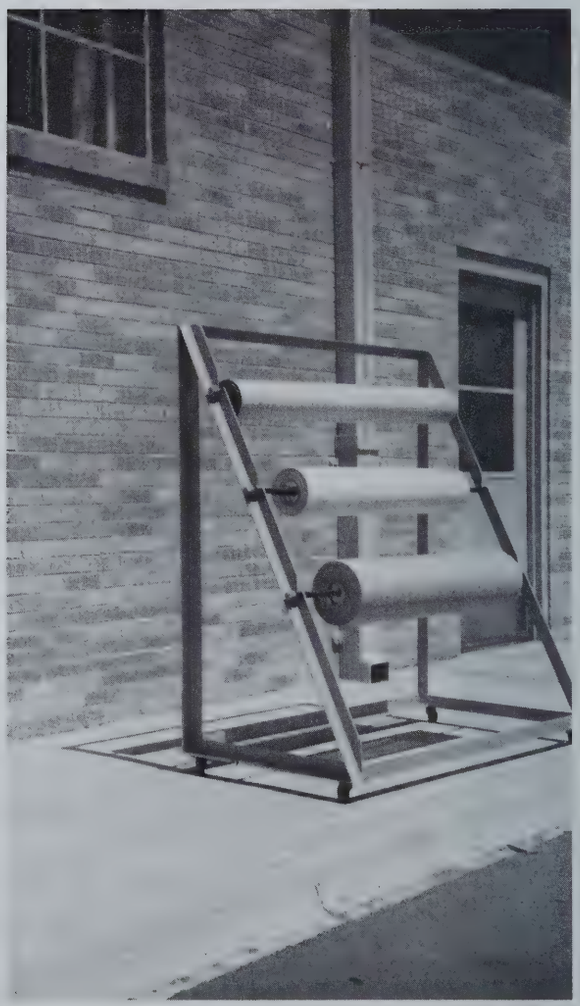
PAPER RACK

Joel D. Willson, Senior Maintenance Superintendent
District 5

Two of our skilled laborers, R. W. Breedlove and Jimmie Alverson, developed a paper rack for use in our sign shop. The rack holds three types of stencil paper. Workmen can roll off as much as needed at one time onto the stencil-cutting table without getting wrinkles in the paper.

The rack is made of two-inch angle iron, and the rolls of paper are mounted on three-fourths-inch black pipe, capped, which fits into notches on the side members, as shown in the pictures. Rolling casters permit the rack to be moved easily.





KEY TO PICTURES ON PAGE 12

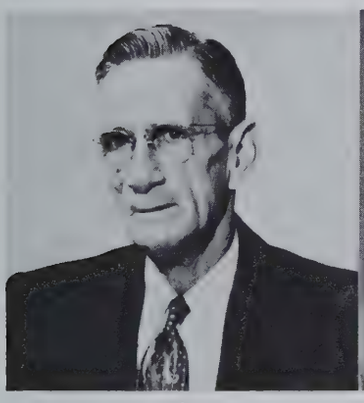
1.
George Pendergrass
Director, Accounting Division
Austin, Texas

2.
C. B. Thames
District Engineer
Bryan, Texas

3.
A. W. Eatman
Materials and Tests Engineer
Austin, Texas

4.
Palmer Massey
District Engineer
Childress, Texas

5.
Ed Bluestein
District Engineer
Austin, Texas



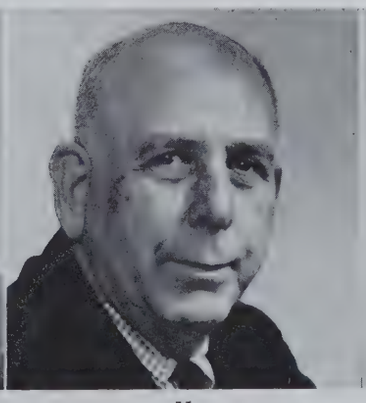
6.
John L. Green
Director, Claims Division
Austin, Texas

7.
J. A. Snell
District Engineer
San Angelo, Texas

8.
A. C. Gentry
District Engineer
Tyler, Texas

9.
John B. Nations
Director, Equipment and Procurement
Austin, Texas

10.
A. C. Kyser
Urban Project Engineer-Manager
Houston, Texas



11.
Harvey Deen
Engineer of Aid Projects
Austin, Texas

12.
Tom Collier
District Engineer
Waco, Texas

13.
Fred T. Bennett
Engineer of Information and Statistics
Austin, Texas

Soil Exploration for Foundations*

Eldridge B. Ward, Laboratory Engineer
Houston Urban Expressways

The field of soil mechanics has made great progress in the past ten to twenty years. Even with all the improved exploration and testing equipment, there are still a few engineers who regard foundation exploration and testing as a waste of time and money. Some of these engineers may not have been exposed to soil mechanics, others may have been just plain lucky, so to speak. Still others may have had a failure or have taken the exploration and test data but still have had a failure due to the improper analysis of the results. Examples of subsurface failures which could have been prevented by proper foundation investigation would fill a couple of books. The time and money spent in soil exploration and testing is only a small fraction of the cost compared to life and property damage resulting from subsurface failures.

Our main purpose in soil exploration for foundations is, first of all, to make the structure safe for the public; and second, to arrive at a safe foundation with a minimum cost. The quality of our work can result in tremendous savings, or waste a great deal of the taxpayer's money.

Only last summer I witnessed an example of what not to do in soil exploration. I went on a job to help familiarize myself with a new drilling rig that belonged to one of the local companies. While waiting for the drill truck to arrive, the representative of the engineer came on the site and paced off a location where the greatest loads would be according to the plans he was holding. He made a small clearing with his foot about the size of a shoe. Then, he stepped into the area and placed all his weight on the heel of his shoe and bounced up and down a couple of times. Stepping back and seeing no depression where he had made this test, he remarked, "Since I weigh approximately 180 pounds and my heel has almost ten square inches, that makes eighteen pounds per square inch, or 1.3 tons per square foot." He then looked around and said, "About a sixteen-inch grade beam should do it." The soil boring along with the testing results proved to be a lot more reliable than his test. It just so happened that there were about two feet of stiff material on the surface and below that, eight to ten feet of soft to medium silty clay with an allowable bearing capacity of 900 pounds per square foot. We could say this fellow falls in the group which has not been exposed to soil mechanics, or has been just plain lucky.

All structures must have a foundation. It is the purpose of the foundation to transmit the loads of the structure to the material beneath it. The ideal condition would be to place the foundation in solid rock. Those of us from East Texas or the

*Speech presented at the Thirty-second Short Course.

Gulf Coast know that it will probably be anything but rock; that is, unless we penetrate some 1,500 to 2,100 feet. Since a foundation cannot be carried to such extreme depth, we must be content to find a material beneath the structure which will support it without excessive or harmful settlement. The foundation may be piles, spread footings, underream footings, or a heavily reinforced concrete mat. Since there is a great difference in the cost of these foundations, we must determine which is the most economical. This problem cannot be approached without first having made some type of soil exploration or foundation investigation. The purpose of such an investigation is to determine the extent and physical characteristics of the principal soil strata, the ground-water table, and to obtain the necessary field test and samples from the various strata for testing.

Subsurface investigations can be divided into two groups, preliminary and detail. In both cases, the majority of the explorations are made by borings.

Preliminary explorations are usually made to locate and classify the various strata. These explorations consist of hand-auger borings, continuous power-auger borings, wash borings, fishtail borings, and thick-wall core-barrel borings. The use of the hand auger is somewhat limited to depth and is slow, besides being hard work. Information obtained by use of the continuous power auger, wash boring, and fishtail borings is very unreliable and about all you have to show for your efforts is a hole in the ground. However, they are helpful in locating rock formations. Most widely used for preliminary borings is the thick-wall core barrel, or what the Highway Department calls a dry-barrel sampler. It can penetrate a wide range of formations with a good percentage of sample recovery. Due to the thick walls, the sample will be disturbed but can be easily classified. The strata changes can be located with more reliability with this type of boring than with any of the types mentioned before. Very few tests can be made on any of the samples taken from preliminary borings.

Detail investigations are by far the most beneficial, but the most expensive. They consist of test pits and undisturbed core borings. Test pits are seldom employed, except where large undisturbed box samples are required. The undisturbed core boring is the most widely used in foundation investigations. In recent years, a wide variety of core barrels for taking undisturbed soil samples has appeared. As most of you know, the Texas Highway Department uses the four-inch Denison double-tube core barrel as standard equipment on its drilling rigs. The Houston Urban Expressway uses the three-inch Shelby tube. Some of you might immediately ask, why use the Shelby tube when the State-owned rigs are equipped with Denison barrels? There are a couple of good reasons for employing the Shelby tube, the most important being the higher percentage of sample recovery—at least for this area. Another reason is that a Shelby tube is easier to handle and does not require the time to assemble or disassemble that the Denison barrel does.

All structures of any major importance should have detailed subsurface investigations made. For building, the minimum number of borings to locate the extent of the strata is three. However, if any unusual condition is encountered, there should be additional borings made to define the horizontal limits of such stratas. There is no set rule for the depth of a boring, but it is a general practice on borings for building to carry them to a depth of one and one-half to two times the least dimension of the building. As for bridge investigation, there are too many intangibles involved to state the number of borings and their depth. The Bridge Division in Austin requests one boring at each abutment and a sufficient number between the abutments, not to exceed 250 feet. I would like to add to this. If adverse conditions exist, it would be advisable to have a boring at each bent in the bridge. If it is evident from the borings that piles are going to be used, at least one of the borings should extend to a depth of 100 to 150 feet to disclose unusual soft deposits, if any.

In the Houston area there is a wide variation in the ground-water table, so we prefer to begin our push barrels with a dry hole until the water-table is reached. Then the use of circulating water carries the boring below the ground-water table. The main disadvantage in starting with a dry hole is that the sample is often difficult to remove from the push barrel.

Normally, push-barrel samples are taken continuously. When the push barrel is brought to the surface, it is clamped into a hydraulic jack, known as a sample extractor, and the undisturbed sample is ejected from the tube. It is immediately classified and logged in the field book. If the sample is to be tested in the field, it is prepared for testing. If the sample is to be sent to the laboratory for testing, it is wrapped in aluminum foil and placed in an ice cream carton, then sealed with paraffin to prevent loss of moisture. A jar sample should always be taken whether it is tested in the field or sent to the laboratory. Our office has used both methods of handling the sample, that is, field testing and laboratory testing. There are certain advantages and disadvantages to either method, but I personally believe that better and more consistent results are obtained with laboratory testing.

The Bridge Division in Austin requests that penetrometer tests be made at least every ten feet, whether the material is sand or clay. However, if all the test data is to be forwarded to the Bridge Division and they are to design the foundation, it would be advisable to have the penetrometer test made as often as every four feet.

The penetrometer test consists of driving a three-inch solid metal conical point into a formation by drop-

ping a 170-pound weight a distance of 24 inches at the rate of 24 to 30 blows per minute and recording the number of blows it takes to drive the point a total of twelve inches. The blows are recorded for the first six inches and the second six inches. If, however, the point is driven into a very dense or hard formation, the blows are recorded as the inches travel for each 50 blows of the hammer.

In case someone might have a question concerning the penetrometer test, I took all our triaxial test results, which covered approximately 90 test holes, and used only those tests that were in the same stratum and within two feet of the penetrometer test and plotted our own curves to check the curves furnished by the Bridge Division. Our curves were about 30 per cent higher than the 1952 correlation curves. The Bridge Division revised their correlation curves in 1955, and we are still higher. After having checked on these correlation curves, I have no fear in using them. They are well on the conservative side for design.

The field classification of the soil contained in the various strata is very important, and only competent persons should be in charge of logging and classification of the material. When the material is taken to the laboratory for testing, it should be checked and reclassified. To my knowledge, there is no standard terminology for classifying soils. The recommended terminology and basic soil symbols, as set forth in the "Texas Highway Department's Foundation Exploration and Design Manual," are very good and should be used in preference to any other. However, there are a few additions I use which I have found to be helpful for field identification of consistency of cohesive and cohesionless materials.

Improper soil classification can be misleading and very costly. One example of such an incident might insure more thoroughness in classifying material properly.

About three years ago, a soil investigation was made on an overpass structure with all classifying and testing of samples carried on in the field. To my knowledge, there were no jar samples taken. The boring logs and test data were turned over to the Laboratory, and it was decided that an underream-type foundation could be used, based on the logs and triaxial test. Footings were to sit in a stiff, sandy clay at about 20 to 24 feet.

The contract was let and construction started. Material removed by the underreaming company indicated that the material was a clayey sand. The shaft was carried to 80 feet and still nothing could be belled for an underream. The contractor moved to the other side of the structure and the same procedure was followed. Still no stiff, sandy clay. The contractor was ordered to stop, and a foundation core rig was put on the site. Six borings were taken and the sandy-clay strata turned out to be a clayey sand. The entire foundation had to be redesigned and steel H-piling used. Field change alone was approximately $18,000. All this extra work and cost resulted from misclassifying the material.

Recently we have found it money well spent if an underream is actually attempted prior to letting a contract. We drilled nine shafts and bells to the size shown on the plans for a cost of $2,300. This is only a small percentage of what a field change might cost if the material cannot be successfully underreamed.

I would like to bring to your attention that there are a number of well-qualified men in the Bridge Division in Austin who are willing to help you with either exploration or design with normal or unusual soil conditions.

Color

In color description of sample, the predominating color is stated first

Consistency of Cohesive Soils

Classification:	*Field Identification:*	*Laboratory Identification:*
Very Soft	Tall core will sag under own weight.	Less than 0.25 Tsf Unconfined Compressive Strength
Soft	Core can be pinched between thumb and forefinger.	0.25-0.50 "
Medium Stiff	Core can be easily imprinted with fingers.	0.50-1.00 "
Stiff	Can be imprinted with considerable pressure from finger.	1.00-2.00 "
Very Stiff	Can be imprinted very slightly with pressure from fingers.	2.00-4.00 "
Hard	Cannot be imprinted with fingers; may be penetrated with pencil.	Over 4.00 "

Relative Density of Cohesionless Soils

Classification by Standard Highway Penetration Resistance:

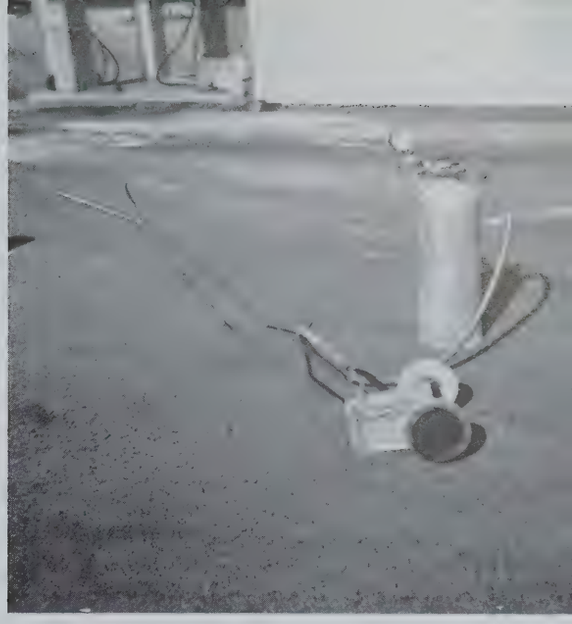
Loose — 0 to 12 Blows per foot Dense —30 to 50 Blows per foot
Medium Dense —12 to 30 Blows per foot Very Dense —50 and above

Soil Structure

Slickensided —Cut by old fracture planes which are slick and glossy in appearance.
Fractured —Containing old shrinkage cracks, frequently filled with fine sand, silt, or clay of color differing from main soil.
Varved —Composed of thin laminae of varying color and soil types.
Interbedded —Composed of alternate layers of different soil types.
Calcareous —Contains deposits of calcium carbonate.

Temporary Pavement Marking Mechanized

Frank P. Faris, Senior Resident Engineer
District 14



A garden spray, with two side plates to control splash, is mounted on six-inch wheels. The storage tank with air compressor attached is in the background.

Since the beginning of publication of TEXAS HIGHWAYS, some years ago, many articles dealing with center-striping operations have been written. These articles have aided in the improvement of techniques used in our operations.

In the June 1955 issue, an article by J. M. Owens, Assistant District Engineer, described the placing of whitewash mixture as a temporary traffic stripe. This stripe is placed close behind the rollers on asphaltic concrete surfacing projects. Use of the temporary stripe has been continued in this District, and we have found it very helpful to traffic control and safety.

Two of Senior Maintenance Foreman Eric F. Bartz's men, Skilled Laborers Walter E. Burke and Carl Adams, have designed and constructed a simple spray gun for applying this temporary stripe.

An ordinary garden spray is the principal part of the equipment. Two side plates four inches by eight inches, spaced four inches apart and mounted on six-inch wheels, are attached to the spray nozzle to control splashing. The spray nozzle is mounted so that the spray is applied to the pavement at approximately a 45-degree angle.

The storage tank for whitewash is attached to an air compressor by a short length of welder hose. Sixty psi pressure in the storage tank is controlled by hand, with a valve placed in the air line. The operator sits on the tailgate of the sign truck and places his feet on the spray assembly to prevent its bouncing during application of the stripe. The sign truck, following center-line points, travels eight to fifteen miles per hour and a stripe four to six feet long is placed at about 40- to 50-foot intervals. A guide bar, fastened to the bumper of the pickup, is a short length of one-half-inch pipe. This pipe is aligned with center reference points, and a short piece of masking tape attached to the windshield completes the guiding arrangement. An entire day's run, one to two miles, of placing asphaltic concrete can be striped in 30 to 40 minutes—including mixing and preparing the whitewash.

The entire assembly was fabricated in the Section Warehouse in Georgetown, in four man-hours time.

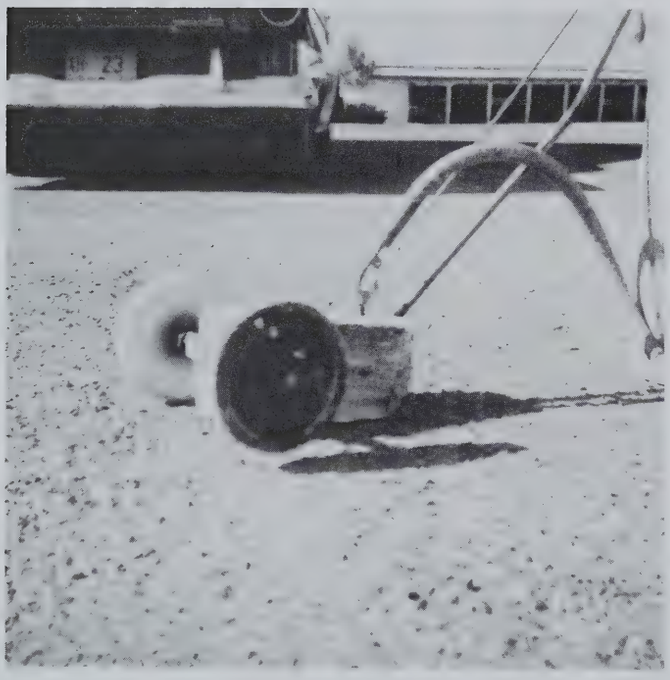
We feel that the development of this simple gadget is a significant contribution to our operation. It is another example of the ingenuity of our personnel when they are interested in their work and thinking of better ways to accomplish it.

A length of welder hose joins the whitewash storage tank to the air compressor.

To prevent the spray assembly from bouncing, the operator sits with his feet on the spray assembly.

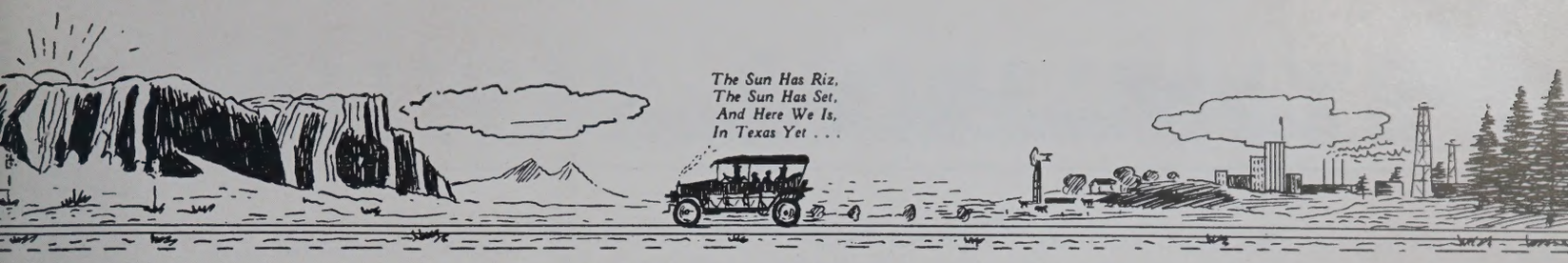
A short piece of masking tape on the windshield, and a guide bar on the bumper of the pickup make up the guiding arrangement for the center stripe.

A stripe four to six feet long is placed at 40- to 50-foot intervals.



Close-up of spray assembly.

Inventors Carl Adams and Walter Burk pose with their Senior Maintenance Foreman, Eric F. Bartz, behind their spray gun.



OVER THE HIGHWAYS

Comments . . . from the Traveling Public

On May 30, 1958, I was returning from Fort Worth and proceeding at a lawful speed of 60 miles per hour. At a point about three or four miles south of ———, a state-owned car bearing the Texas EXEMPT license passed me at a speed I judged to be about 75 miles per hour. As this car passed me the tires threw some pebbles into my windshield and damaged it in two places, which will make it necessary to replace in the near future.

I watched the offending car and just a few minutes later I approached a speed zone where the marking stated that the speed was 40 miles per hour. I cut my speed down to comply with the law and marked area, but the car continued to travel at the same speed at which it was going right through the zoned area.

Not only am I disturbed at the fact that this car is owned by the State of Texas, but it creates a safety hazard by a driver that is employed in effect by me, as a taxpayer of Texas.

I wonder what the EXEMPT label on the State-owned vehicles really means. I thought that it was to mean that the state license was exempt from payment, but I had no idea that it could be construed as meaning that the drivers of such cars were exempt from obeying laws that are for the protection of the traveling public. . . .

T. A. Juhring
Houston, Texas

Mr. Carmichael's answer to Mr. Juhring's letter is also being printed —for several reasons. First, it shows that complaints from the traveling public are not ignored, but are followed through completely. Next, the letter would make anyone—even a motorist with a cracked windshield—become a friend of the Department.

Thanks for your letter of June 3 in which you call our attention to an incident of apparent improper operation of State-owned vehicle. After receipt of a copy of your letter, I have made an investigation to determine as nearly as possible the conditions connected with this incident.

This car was driven by Mr. ——, of the Texas Highway Department, who works under my supervision. Mr. ——is well known to me, having been employed by the Highway Department continuously since 1938, except for a period of time during World War II when he served in the armed forces. Mr. —— has been a valuable employee and a loyal one, and has served us especially well. It is evident that on this particular occasion he was imprudent with respect to his responsibility and obligation to operate State equipment in an exemplary manner. This is the first occasion of any such indiscretion that has come to my knowledge, and I feel sure that it is one of the few cases in which he failed to operate equipment in the way that we intend that it shall be done. He has been reprimanded for this act, and it is my opinion that you may be sure that your calling this to our attention has served him well and has served as a particular reminder to us all that we surely have an obligation to obey all laws and all rules of courtesy for proper operation of vehicular equipment on the highways.

Inasmuch as we do make concerted efforts to conduct our work in a way that would meet with your approbation, we do appreciate your interest in this matter and assure you that it has accomplished much good.

W. E. Carmichael
District Engineer
Houston, Texas

On or about the dates of May 16 to 21 through the courtesy of our mutual friend Mr. H. M. Taylor your department planned a trip for us extending from Austin to Anchorage, Alaska, by automobile through the Western states on into Canada. Returning from Anchorage via Dawson Creek, B. C., Edmonton, Jasper Park, and Calgary back into the states via Yellowstone, Jackson Hole, Salt Lake City, Santa Fe, and Austin.

The maps of the different states, mileage charts, and descriptive folders of the principal places of interest to see which you furnished could not have been better. We followed your suggested route almost to the letter and found the roads satisfactory and the information furnished was all we needed to make our trip successful and pleasant.

We wish to thank you most sincerely for your interest in preparing the information for us. It was a real service. Mrs. Whatley joins me in sending our thanks and best wishes.

Jess J. Whatley
Austin, Texas

To and From Our Readers

I received the parcel containing the copy of TEXAS HIGHWAYS containing the fine article on the archeology of Texas, named "History Along Our Highways." I find this article very interesting and I am certainly very pleased that you were good enough to send a copy of this magazine to me. Thanks a lot!

Also many thanks for the beautiful photograph of the Palo Duro Canyon, the scene of the ancient Comanche wintering place. As you have received my enquiry via the Texas Highway District Office of Wichita Falls, to which I address my letter, I should appreciate it if you would convey my thanks also to them for kindly passing my request on to you.

Your help is much appreciated and whenever a similar article appears in your magazine, I would be happy indeed if you could send me a copy! Once more, I thank you for helping me.

A. A. Jansen
Gronigen
The Netherlands

"You see, with these radios we always know exactly where everybody is!"

About the Cover . . .

Autumn in any section of the state is attractive to behold. West Texas offers one type of beauty, north and south offer another. On our cover this month is East Texas, with the rich greens and rusty browns of the pines and varying greens of the sweet gums and white oaks.

To the delight of motorists, pine cones are ready to fall, and tourists with children in their cars will go home laden with cones which they won't know what to do with until Christmas. Then, cones will appear in decorations with a spray of silver covering them.

Pictured is State Highway 26, between Longview and Kilgore.

TEXAS HIGHWAY COMMISSION

MARSHALL FORMBY	Chairman
HERBERT C. PETRY JR.	Member
CHARLES F. HAWN	Member
D. C. GREER	State Highway Engineer

Texas Highways

TEXAS HIGHWAYS, official journal of the Texas Highway Department, is published in the interest of highway development in Texas and for departmental education in the improvement of construction, maintenance, and operation.

All material and manuscripts should be directed to the Editorial Office, Division of Information and Statistics, Texas Highway Department, Austin 14, Texas.

HIGHWAY SIDELIGHTS

Gordon K. Shearer, Director of Research
Texas State Parks Board

Quite a familiar sight to earlier generations of Texans can be seen by travelers who turn into the east side of Fort Griffin State Park on U.S. Highway 283 between Albany and Throckmorton.

This side of the park has become the home of a state herd of Longhorn cattle, branded appropriately with a Texas star.

Until adequate fencing can be provided on the west or fort side of the park, the herd is being held to about 40 head. There is insufficient grazing for more on the east side of the park.

Larger horns can be seen on heads mounted and hung on walls. Some individual specimens are on display at various places also with larger horns. The state herd at Fort Griffin is selected to show the prevailing types that once roamed the prairies, regardless of color or freak horns.

This is the herd from which has come a succession of mascot steers for The University of Texas football teams. One of them, spotted Bevo VI, can be seen among the Longhorns at Fort Griffin. He was returned to the park herd when he became too wild for safe control at stadiums. Visitors are cautioned not to go through the fences.

Arguments will probably never end about the origin of the Longhorns. Generally they are accepted as the outcome of mixing imported fighting bulls from Spain with the wandering herds of wild cattle in the Southwest. Whatever their origin, Longhorns made Texas history. The trails over which they moved in earlier days created many of the cities that today's highways connect.